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NOTES ON THE ROSE STEM GIRDLER, *AGRILUS COMMUNIS* *RUBICOLA* AB.

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The rose stem girdler (*Agrilus communis rubicola* Ab.), a pest of European origin, was first recorded on this continent in 1913. The earliest report of its presence in Ontario was made in 1931 in the Windsor area by Mr. C. S. Thompson, formerly of the Dominion Plant Inspection Service, who found it infesting roses on private grounds. The roses had been obtained in 1929 from a Michigan nursery which had imported them from Holland. From 1931 to the present there have been scattered records of its presence across southern Ontario from Windsor in the west to the Niagara river in the east and to Guelph and Clarkson in the north. It is highly probable that it is spread over much larger territory.

The hosts in Ontario, so far as known at present are many species and varieties of rose both wild and cultivated, red raspberry, black and red currants, and gooseberry. Rose is given as the original host and until fairly recently was the only host listed. Though many species are attacked, *rugosa* and varieties grafted on it (such as Grootendorst) seem to be preferred.

In 1937 our attention was first drawn to a serious outbreak on raspberry near Smithville in Lincoln county. A small patch of the variety Cuthbert was so badly injured that more than half of the canes had broken over and of the remainder many were killed above the point of attack. Injury was noted at the same time to Latham and Viking varieties. Subsequently the beetles were taken at several other points in Lincoln county on raspberry and some material was received from St. Thomas, Elgin county.

In 1938 a plantation of black currants near Beamsville was found infested by this species, considerable damage having been done as evidenced by the killing of half the canes on some bushes. Further search in 1939 easily located the injury on red currants and also on gooseberries. Where all three were growing together, black currant was preferred followed by gooseberry, red currant being affected least of all. There is little doubt that black currants have been attacked for years in many sections, but the injury, where noticed, has been attributed to other borers, chiefly the clearwing moth, *Synanthedon tipuliformis* L.

The injury is almost entirely due to the larvae tunneling in the woody stems, usually girdling them and killing the shoot above the point of attack. On roses a swelling or gall, one to three inches long and which may be scarcely noticeable or quite conspicuous, appears at the point of attack. Sometimes the spiral tunnel will show clearly on the gall surface giving the appearance of a piece of wire wound round the stem. On raspberry the gall formation is less common, the cane usually not being thickened beyond the immediate neighbourhood of the tunnel. The spiral tunnel, however, often shows very clearly, resembling the thread of a screw, and the stem breaks off easily at such places. On gooseberry the external signs may be very indefinite and are not so readily seen owing to the rough nature of the stem. Galls are rather rare, but short lengths of tunnel may be seen as thin swellings on the surface. On currants no galls have yet been found, and commonly there is no external effect visible beyond the wilting and dying of the cane. Occasionally, however, a slight ridge marks the course of the tunnel.

Winter is apparently passed in the mature larval stage within the stem. Emergence of adults at Vineland Station (Lincoln county), Ontario, began the first week in June, June 3 being the earliest in the last two years, when black currant blossoming was just over and the fruit had set. In 1939 the peak was reached on June 11; the last emergence was on June 22 in 1939 and about a week later in 1938. Caged adults lived about three weeks. In the field they were plentiful and active on June 19, were less numerous by July 3 and none were noted on July 11 though there were still a few alive in a cage covering one of the bushes. They were most active during the hottest part of the day and seemed to prefer the warmer locations. Long rows of roses, for instance, were found most heavily infested on a section which had a south slope. In a field cage and in lantern globes in the insectary, the beetles fed freely on the margins of black currant leaves, leaving the latter with a ragged appearance similar to rose chafer injury. Since they moved around freely in the field, the feeding injury was not concentrated and, therefore, quite inconspicuous as a rule, but could always be found where beetles were present. Eggs were deposited singly on the smooth parts of woody stems, chiefly of the current year's growth, though often on older wood, particularly in the case of currants and gooseberries. The egg was quite small and covered with a secretion which in time became very hard and brittle. The whole looked remarkably like a small scale-insect on the bark and was readily visible to the eye, being about 1.5 mm. long by .75 mm. wide. The long axis was usually parallel to that of the twig, for, in applying the covering, the female extended and shortened the abdomen and did not move it from side to side. The egg covering when fresh was a lemon yellow colour but later darkened to much the same colour as the twig on which it was laid. Finally, if it remained on long enough, it lost all colour and became white. One or more faecal pellets were nearly always found on the egg covering. The actual hatching could not readily be observed, for the tiny larva entered the stem under protection of the covering which became filled with frass and often remained in situ long after the larva had departed. The larvae bored in the wood and pith, sometimes forming a very regular spiral of 3 to 7 turns to the right or left just under the bark, nearly always ascending and, at least in raspberry, ending by going vertically upwards about an inch to an enlarged chamber which might be either near the surface or deep-seated. In other cases, the course taken was often very erratic though it usually included a girdle of at least one turn.

Parasites of the beetle have been found in infested raspberry canes, an examination of some of the canes in the Smithville outbreak referred to above showing a parasitism of well over ninety per cent. On October 1, the tunnels were found to contain hymenopterous larvae, pupae, and adults. Several hundred infested canes collected in the autumn and placed under a darkened cage the following spring yielded practically no parasites and very few beetles. Such a degree of parasitism has not, however, been found in other infested host plants.

In view of the feeding habits of the adults, it would seem feasible to control the insect by spraying, and a small experiment carried out this season lends support to this idea. On June 8 two black currant bushes were covered with wire screen cages, one of the bushes being well sprayed with Bordeaux 3-6-40 and 2 lbs. lead arsenate to 40 gallons and the other left unsprayed. Between June 8 and 20, a total of 120 beetles was added to each cage. The contrast between these two bushes later in the season was quite striking. The unsprayed bush showed much ragged foliage due to feeding, and a hasty examination disclosed 203 eggs, whereas the sprayed bush showed no signs of feeding whatever, and very careful scrutiny failed to find a single egg. Two small-scale experiments in the insectary yielded similar results. It was not clear whether the spray acted as a deterrent or poison, i. e., whether the beetles died from starvation or poisoning. In any case it appeared that considerable feeding

was necessary before eggs were laid. Though many more experiments are needed to find out the nature and strength of the most efficient spray, the results above are most encouraging.

The writer is indebted to Mr. L. S. McLaine, Chief of the Plant Protection Division, Mr. R. W. Sheppard, and Mr. W. A. Fowler District Inspectors of Niagara Falls and Toronto respectively for information on first records, distribution, and hosts of the rose stem girdler.

THE ARGYNNIDS OF THE CARIBOO REGION OF BRITISH COLUMBIA (LEPID.) *

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The Cariboo region comprises that section of Central British Columbia between the Fraser river and the mountains of the N. Thompson river, extending northward from Clinton to Quesnel; through it the old Cariboo trail (now a motor road) passes and railway communication with the south is afforded by the P. G. & E. Ry. Its altitude is around 2500 ft. and it consists largely of rolling, wooded country interspersed with numerous lakes; in the southwest in the vicinity of Jesmond, Mt. Bowman, a northern spur of the mountains back of Lillooet, rises to a height of about 7500 ft. The summer rainfall is slight, and the area belongs in the so-called "dry belt".

In 1937 one of my assistants, Mr. J. K. Jacob, made large collections of Lepidoptera in the vicinity of Jesmond and in 1938 Mr. G. S. Walley accompanied by Mr. Jacob made an extensive insect survey of the region, starting from Clinton and Jesmond in early June and working north as far as Williams Lake by mid-July; in the latter part of the summer Mr. Jacob continued the work alone in the Jesmond region. Particular attention was paid in 1938 to collecting Argynnis as topotypical series of both *rhodope* Edw. and *columbia* Hy. Edw. were desired. In consequence considerable material in this group was obtained and the following notes on the various species may be of interest as the region is one in which little collecting has been done of recent years.

Argynnis aphrodite columbia Hy. Edw.

Argynnis columbia Hy. Edw., 1877, Pac. Coast Lep. No. 26; W. H. Edwards, 1877, Field & For. III. 102; Barnes & McDunnough, 1916, Contr. III (2) 74; Gunder, 1932, Can. Ent., LXIV, 279.

This race of *aphrodite* was nowhere particularly common and appears considerably later in the season than an *atlantis* form to be discussed later. Three fresh males were captured at Williams Lake, July 11-13 and a single rather worn male at Clinton, July 27. At Jesmond the two years' collecting produced eleven males, the dates ranging from July 24-August 15 (latter specimen quite worn). The males are easily separated, among other things, by the entire lack of the broad black scaling on the veins of the forewings such as is found in *atlantis* and *cybele* forms. The females, on the other hand, are extremely difficult to distinguish from those of allied species. I have picked out six, taken at Jesmond on various dates between August 15-23 which I believe to be correctly associated; these are a somewhat paler brown on upper side than the *atlantis* form and the submarginal spots on primaries are very pale (almost whitish) in the apical section; the marginal black border is less solid, especially on secondaries, and on these there is a faint pinkish shade along the costal area lacking in *atlantis*. On the underside the basal two-thirds of primaries tends to be ruddier than in *atlantis*.

*Contribution from the Division of Entomology (Systematic Entomology), Department of Agriculture, Ottawa.

Gunder's remarks (*op. cit.*) show that he was unacquainted with the true female of the species and had most likely wrongly associated females of *atlantis* with the *columbia* males, as these are both on the wing at the same time, the true *columbia* females appearing considerably later.

***Argynnis atlantis beani* B. & Benj.**

Dryas atlantis race *beani* B. & Benj., 1926, Proc. S. Calif. Acad. Sci., XXV, 92; Gunder, 1932, Can. Ent., LXIV, 280.

The dominant *Argynnis* of the region is an *atlantis* form which I am assigning to the race *beani* B. & Benj. The original description of this race is brief and not very helpful; judging by a worn paratype and other topotypical material before me *beani* may be considered as a rather small, lightly marked form which occurs in the Bow Valley at Banff and extends in Alberta southward along the eastern foothills of the Rocky Mts. to the Crow's Nest Pass and Waterton Lakes. The underside of the secondaries is generally rather bright red-brown in the basal two-thirds. Specimens from the Cariboo region are larger (at times considerably so) than typical *beani* but otherwise I can see little difference from the Albertan race and this was evidently Gunder's opinion as he notes the occurrence of *beani* in central British Columbia. Long series of very fresh material were captured at Canim Lake, June 21-25 and at 100 Mile House, June 28-July 3; smaller lots were taken at Lac LaPêche, Williams Lake and 150 Mile House somewhat later in July, the specimens (especially the males) already showing signs of wear and tear. It also occurs at Jesmond but apparently not commonly. Considerable variation occurs in the race and hardly any two specimens are exactly alike. In general the upper side black maculation is not so heavy as in eastern specimens and the general appearance is therefore lighter but all intergrades to heavily marked specimens with intensive black borders occur. The underside of secondaries varies from a dull red-brown to a distinctly bright reddish brown (the more typical color) and the width of the yellowish subterminal band is variable, depending on the encroachment of the dark color from the basal and marginal areas. Occasional specimens occur of the deep purplish-brown color commonly found in material from wetter regions and higher altitudes in the Rockies; at Likely, which is closer to the foothills of the Thompson river mountains and consequently moist-er, about half the specimens were of this darker color.

Very occasionally specimens with a partial unsilvering of the spots were noted.

***Argynnis hydaspe rhodope* Edw.**

Argynnis rhodope Edw., 1874 Trans. Am. Ent. Soc. V, 13; *id.*, 1875, Butt. N. Am. II, Arg. VI, figs. 1-4; McDunnough, 1927, Can. Ent., LIX, 154.

A single female was captured at Clinton, July 20 by J. K. Jacob. The race is apparently rare in the district and I have nothing further to add to my previous remarks on the subject.

***Argynnis bremneri picta* McD.**

Argynnis halcyone picta McD., 1924, Can. Ent., LVI, 43; Gunder, 1932, Can. Ent., LXIV, 282.

In the original description this race was recorded as from the Cariboo district which is scarcely correct as the region is defined in the present paper, Aspen Grove, the type locality, being somewhat south of Merritt and Nicola. It is, however, listed as being in the Cariboo Electoral District, which was the reason for the statement at the time of description.

Single males were taken at Williams Lake, July 13, 70 Mile House, July 14, and Clinton, July 20. It was evidently just emerging at this time as a longer series was taken at Pavilion Lake, south of Clinton, on July 29 and it was taken in both years at Jesmond from late July to mid-August. The form seems

best placed as a race of *bremneri*; from other species of the region it is separated by the rather bright red-brown color of the basal two-thirds of the underside of the secondaries and by the width separating the marginal silver lunules from the first discal row; these marginal lunules are generally flatly oval rather than triangular and differ notably in this respect from those of the following species. On the upper side the black spots of the median row on primaries are heavy and quadrate and in the females they are relieved outwardly by a yellow-brown shading, considerably paler than the ground-color.

***Argynnis nevadensis semivirida* McD.**

Argynnis nevadensis semivirida McD. 1924, Can. Ent. LVI, 42.

This race was described from the same locality as the preceding one, viz., Aspen Grove. It was apparently not uncommon and quite fresh at 100 Mile House during the last days of June and the first ones of July 1938; at Williams Lake specimens taken July 11-13 were already slightly worn. Single males were captured at Clinton June 18 and Canim Lake June 23 and several specimens the previous year at Jesmond in mid-July.

The above specimens bear out to an even greater degree than do the type specimens the character on which the name *semivirida* is based, i. e., the partial replacement of the green of the underside of secondaries by brown shades. On the whole very little trace of green on the underside is found in the majority of specimens now before me but as certain specimens (especially somewhat worn ones) agree quite well with the type, I am including the whole series under the name *semivirida*; the diagnosis of the race could be extended to include specimens showing either a partial or an entire replacement of the green underside suffusion by brown coloration.

***Argynnis bischoffii opis* Edw.**

Argynnis opis Edw., 1874, Trans. Am. Ent. Soc. V, 105; *id.*, 1875, Bull. N. Am. II, Arg. III, figs. 5-8; B. & McD., 1913, Contr. II. (3) 94; McDunnough, 1927, Can. Ent. LIX, 155.

I have already commented on this race (*op. cit.*), based on specimens with unsilvered spots on underside from "Bald Mt. Cariboo". So far I have failed to locate this mountain which was said to be near Lake Lahache; there are no mountains, however, particularly close to the lake and enquiries on the spot were of no avail. It is likely that the specimens were captured further to the northeast toward the Barkerville region from which we possess several specimens with both silvered and unsilvered spots.

At Jesmond in both years good series were taken from 3500 ft. to above 6000 ft. during the latter portion of July and early in August and two males were captured at Clinton, June 18 and July 20, 1938. With a single exception all these specimens have the spots on the secondaries well-silvered; the basal two-thirds of the secondaries is strongly suffused with brown, especially in the disk, rather more so than in our Mt. McLean series which come closer to the coloration given in Edwards' figures of *opsis*. In order to distinguish this silvered form of the Jesmond region from the var. *washingtonia* B. & McD. which has the disk of the secondaries beneath considerably greener, I would propose for it the name, form *JESMONDENSIS* f. nov.; it may eventually prove to have racial value but for the present I consider it as a silvered form of *opsis*.

Holotype—♂, Jesmond, B. C., July 24, 1937, (3500 ft.) (J. K. Jacob); No. 4925 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, Aug. 3, 1937.

Paratypes—23 ♂, 11 ♀, same locality and collector; various dates in 1937 and 1938 from July 14–Aug. 3.

A PRELIMINARY LIST OF THE ODONATA OF SASKATCHEWAN

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For many years the writer has been endeavouring to obtain collections of Odonata from all parts of Canada as a basis for a study of their distribution.

Preliminary lists have been published for most of the provinces but very little has hitherto appeared on the odonate fauna of Saskatchewan. The nearest approach to a list of the species from this province is contained in an early paper by the writer ('12b) in which records of nineteen species from Saskatchewan are given.

In the hope of reducing this gap in our knowledge of Canadian dragonflies I appealed to my friend Dr. D. S. Rawson, Professor of Zoology in the University of Saskatchewan, for a student assistant to collect specimens during the summer vacation. Through Dr. Rawson's energetic response the co-operation of seven students was obtained during the season of 1936. The names of these students and the localities in the vicinity of which their collections were made are as follows: D. R. Foskett, Prince Albert; J. A. Gorchynski, Yorkton and Hamton; P. Hawrylak, Maple Creek and Cypress Hills; D. J. Milne, Regina; J. D. Ritchie, Lac Vert; C. Wagner, Markinch (40 mls. n. e. of Regina); J. H. W. Young, Madison and other localities in the vicinity of Kindersley.

These localities are fairly representative of the various sections of southern Saskatchewan.

In the season of 1937 collections were made by Mr. G. Shaw at Waskesiu and Heart Lakes in Prince Albert National Park, by Mr. E. W. Brooman, also in the vicinity of Prince Albert, and by Mr. Fred Bisal in the Swift Current district.

In 1938 and 1939 Mr. J. E. Moore of the University of Saskatchewan collected a number of dragonfly nymphs and adults in connection with an ecological survey of the saline lakes of southern Saskatchewan, which he was conducting. Nearly all of this material consists of *Enallagma*, chiefly *E. boreale*, but records of the nymphs have been omitted from this paper, since their identification at the present time has proved unsatisfactory. Although characters for distinguishing the nymphs of *E. boreale* and *cyathigerum* have been given by the writer ('16), the addition of material since these were published proves the characters to be unreliable. To add to the difficulty, the nymph of *E. clausum*, a near relative of these two species, is still unknown and may be represented in the collection, since the adults were collected at a number of lakes.

The saline lakes where Odonata were collected by Mr. Moore, with their hydrogen ion concentrations and degree of salinity (per cent) are as follows:

DISTRICT	LAKE	pH	SALINITY
Assiniboia	Kenosee	8.65	.1
Assiniboia	Little Fish		
Mackenzie	Greenwater	8.5	.05
Humboldt	Lenore	8.9	.5
Humboldt	Basin	8.7	1.2
Humboldt	Edward	8.3	.09
Humboldt	Margo	8.85	.1
Humboldt	Fishing	8.6	.3
Qu'Appelle	Echo	8.65	.1
Qu'Appelle	Pasqua	8.65	.1
Qu'Appelle	Katepwa	8.65	.1
Regina	Last Mountain	8.6	.2
Moose Jaw	Antelope	8.9	1.4
Moose Jaw	Clearwater	8.85	.08
Battleford	Big Manitou	9.4	2.0
Battleford	Jackfish	8.7	.1
Battleford	Midnight		.04
Battleford	Soda	9.6	.9
Battleford	Stony	8.9	.04

Finally we have included a number of records from the following sources:

1. Specimens belonging to the Department of Biology, University of Saskatchewan, kindly loaned by Dr. Rawson.
2. Specimens in the National Collection at Ottawa, particularly a collection made by Mr. A. R. Brooks in 1939 at Waskesiu and Cypress Park.
3. Specimens in the Royal Ontario Museum of Zoology, Toronto, collected by the writer in 1913 and 1921.
4. A list of species from Waskesiu, collected by Mr. G. S. Shaw in 1938 and determined by Mr. B. Elwood Montgomery; kindly furnished by Mr. Shaw.

The localities in which Odonata have been collected hitherto, with the possible exception of a few very early records, are all in the southern half of Saskatchewan, the most northerly stations being in the Prince Albert National Park, and the vicinity of North Battleford. While the fauna as a whole consists of species of wide distribution in both Boreal and Austral regions, together with other species which are more distinctive of the Boreal region, the more exclusively boreal or Hudsonian species are largely absent, owing to lack of data from the northern part of the province. Transcontinental species, which should appear in northern Saskatchewan are: *Aeschna juncea* L., *A. subarctica* Walk., *A. coerules septentrionalis* Burm., *Ophiogomphus colubrinus* Selys., *Somatochlora forcipata* Scudd., *S. septentrionalis* Hagen, *S. albicincta* Burm., *S. hudsonica* and *S. cingulata* Selys. Other species which may be expected are *Cordulegaster maculatus* Selys., *Somatochlora kennedyi* Walk., *Williamsonia fletcheri* Wmsn. and in the south, *Ischnura damula* Calv., *Gomphus notatus* Rambur and *G. graslinellus* Walsh.

Even with these fifteen species added to the forty-seven recorded the odonate fauna of Saskatchewan is poor as compared with that of the other provinces except Alberta (Whitehouse '18c). This is to be expected from its central position and the comparative uniformity of its topography. Certain eastern species, which enter eastern Manitoba, such as *Calopteryx maculata* (Beauv.), *Ischnura verticalis* (Say) and *Gomphus fraternus* (Say) (Walker '33) fail to penetrate the open plains while the same is true of such western species as *Ischnura cervula*, *Aeschna palmata* Hagen and *Somatochlora semicircularis* (Selys), which occur in the Alberta Rockies.

Of the more southern species in the list *Enallagma civile* and *E. carunculatum* appear to be local and probably do not occur north of Prince Albert. *E. hageni* is abundant in the south but rare northward, and *E. ebrium* has about the same distribution.

Amphiagrion abbreviatum, *Gomphus intricatus* and *Sympetrum madidum* are western species, although the last named ranges into Manitoba. *Somatochlora ensigera* is also western but enters Saskatchewan and Manitoba from the United States, where it ranges from Montana (Martin, '07) and Colorado (Williamson, '07) to Indiana (Williamson, '12). *Enallagma clausum* is predominantly western but has been taken in Ontario and even Quebec (Walker, '34).

On the other hand *Lestes forcipatus* and *Ophiogomphus rupinsulensis* are eastern species and *Calopteryx aequabilis* is mainly eastern, although the race *yakima* Hagen occurs in Washington (Kennedy '15). Saskatchewan is the extreme western limit of the race *hudsonica* Hagen, so far as known.

The only forms characteristic of the north central plains are *Agriion angulatum*, *Aeschna interrupta lineata* and *Leucorrhinia borealis*. As a species *A. interrupta* is transcontinental but the race *lineata* is characteristic of the central plains, although not confined to the prairies.

The other species in the list are practically all transcontinental and chiefly boreal or general in distribution, the more southern forms whose transcontinental distribution is discontinuous in Canada being *Anax junius*, *Aeschna constricta* and *Leucorrhinia intacta*.

In the following list the names of the collectors listed above are indicated by their initials.

ZYGOPTERA

Calopterygidae

1. *Calopteryx aequabilis hudsonica* Hagen. Waskesiu Lake, Prince Albert National Park, 14, 19 VII 2 ♂ (G.S.).

These two males are identical with specimens from the Hudson Bay slope in Ontario (Patricia section of the Kenora District) and are typical *hudsonica*. This race, however, is by no means sharply defined.

Agriidae

2. *Lestes congener* Hagen. Hamton, 2 VIII, 10, 17 IX (JAG); Kinley, 3, 4 VIII; Prince Albert 6 IX (DRF); Polwarth (VLB); Jackfish Lake, 11 VIII (JEM). Total 11 ♂ 4 ♀, the largest series (6 ♂ 2 ♀) from Hamton.

The dates range from August 2 to September 17.

3. *Lestes unguiculatus* Hagen. Wascana Creek, near Regina, 23-28 VII (DJM); Bredin, 19 VII (DJM); Markinch, 19 VII (GW); Moose Jaw (Johnson); Swift Current district, 30 VIII (FB); Maple Creek, 20-30 VI, 2-22 VII (PH); Eston, 7 VII (JHY); Madison and Glidden, 11-17 VII (JHY); Snipe Lake, 15 VII (JHY); Burstall, 16-17 VIII (EMW); Hamton 2 VIII (JAG); Lac Vert, 19 VII (JDR); Liberty, 30 VIII (DJM); Saskatoon, 16 VII (H. Williamson); Elbow, 9 VII (W. Fox); Prince Albert, 1-29 VII (DRF); Waskesiu Lake, 3-30 VII (GS, ARB); Total 133 ♂ 98 ♀.

Previously recorded from Regina, Goose Lake, Davidson, Radisson and Lumsden (Walker '12b). It is one of the commonest of the Zygoptera of southern Saskatchewan and is found about sloughs and temporary pools. The recorded dates range from June 20 to September 20. The largest series were taken at Madison, Maple Creek, and Prince Albert. Newly emerged individuals were taken at Prince Albert on July 1 and ten pairs in copula from July 11 to 19 at Madison, Glidden, Saskatoon and Prince Albert.

4. *Lestes dryas* Kirby (*L. uncatu* Kirby). Burrows, 24 VI (EMW); Indian Head, 24-25 VI (DJM); Regina Beach, 7 VII (DJM); Wascana Lake, 23-28 VII, 2 VIII (DJM); Bredin, 9, 19 VII (DJM); Caron, 26 VI (EMW); Maple Creek, 20 VI, 2-5 VII (PH); between Alsack and Lovernia, 26 VI (DJM); Madison, 11-12 VII (JHY); Snipe Lake, 15 VII (JHY); Yorkton 14, VI (JAG); Lashburn (in coll. DJM); Prince Albert, 23-25 VI, 1-26 VII, (DRF, EWB); Waskesiu, 12 VII (ARB). Total 22 ♂ 31 ♀.

Previously recorded from Regina and Goose Lake (Walker, '12b). The recorded dates range from June 14 to August 2. The only pair in the collection was taken at Bredin on July 9. This is a circumpolar species, common about temporary ponds in all the Canadian provinces.

5. *Lestes disjunctus* Selys. Swift Current (VLB); Clearwater Lake, 27 VII (JEM); Lac Vert, 17-19 VII (JDR); Prince Albert, 25-29 VII; 2 VIII, 2-16 X (DRF); Big Manitou Lake, 17 VIII (JEM); Jackfish Lake, 11 VIII (JEM). Total 26 ♂ 14 ♀.

Previously recorded from Duck Lake and Regina (Walker, '12b). The dates range from July 17 to Oct. 16, which is about the same seasonal range as in Ontario. In spite of the few records this species is probably the commonest northern species all across the continent, frequenting still permanent waters.

6. *Lestes forcipatus* Rambur. Waskesiu Lake, Prince Albert Nat. Park, 30 VII, 1 ♂ (GS).

An eastern species, unexpected in Saskatchewan as it has not been taken in Manitoba. Its main range is in the United States.

7. *Enallagma clausum* Morse. Antelope Lake, 31 VII (JEM); Lake Len-

ore, 17 VII (JEM); Edwards Lake, 15 VII (JEM); Margo Lake, 10 VII (JEM); Fishing Lake, 11 VII (JEM); Big Manitou Lake, 16-17 VIII (JEM); Stony Lake, 14 VII (JEM); Namekus Lake, 20 V (DRF). Total 12 ♂ 11 ♀.

This species, new to Saskatchewan, evidently shows a preference for saline or alkaline lakes, as has been already noted (Kennedy '17). The localities listed indicate that it is generally distributed in southern Saskatchewan where such lakes are found and that it is sometimes found in freshwater lakes, as in Manitoba and Ontario. May 30 to Aug. 17.

8. *Enallagma boreale* Selys. Little Fish Lake, 2 VII (JEM); Echo Lake, 24 VI (JEM); Regina Beach, 7 VII (DJM); Wascana Lake, 31 V, 9-21 VI, 1-12 VII (DJM); Last Mountain Lake, 5 VII (JEM); Caron, 24 VI (EMW); between Herbert and Waldeck, 28 VI (EMW); Swift Current dist., 18, 30 VI (FB, VLB, O. H. Sparrow); Antelope Lake, 3 VII (JEM); Maple Creek, 19 VI, 22 VII (PH); Clearwater Lake, 27 VII (JEM); Garrison, 16 VI (coll. Univ. Sask.); Lake Lenore, 17 VII (JEM); Basin Lake, 29 VI (JEM); Margo Lake, 10-15 VII (JEM); Vonda, 25 V, 8 VII (M. MacKay); Prince Albert, 13 VI (EMW), 19-23 VI (DRF); Waskesiu Lake, 2 VII (JER); 14-23 VII (GS); Namekus Lake, 30 V (DRF); Big Manitou Lake, 16 VII (JEM); Soda Lake, 2 VI, 21 VII (JEM). Total 102 ♂ (females not separated from *E. cyathigerum* q.v.).

Previously known from Prince Albert and Duck Lake (Walker '12b). The dates range from May 28 to July 27. Specimens taken on May 30 are teneral. Mating pairs are recorded from Wascana Lake on May 31 (3 pairs), July 1 and 12 (1 pair each date) and they are recorded as mating in the Swift Current district on June 18. This is the commonest damselfly in Saskatchewan and the most generally distributed *Enallagma* in Canada. It is abundant in both saline and fresh waters.

9. *Enallagma cyathigerum* (Charp.). Kenosee Lake, 28-29 VI (JEM); Little Fish Lake, 2 VII (JEM); Wascana Lake, 26 V, 9 VI, 2-9 VII (DJM); Caron, 26 VI (EMW); between Herbert and Waldeck, 28 VI (EMW); Maple Creek, 14 VI (PH); Lac Vert, 13-14 VI (JDR); Edward Lake, 15 VII (JEM); Vonda, 8 VII (MM); Saskatoon (AHB); Prince Albert, 13 VI (EMW); 19-21 VI (coll. ?); Crean Lake, 12-14 VI (Univ. Sask.). Total 29 ♂ (females, v. inf.).

Females of *E. boreale* and *cyathigerum* are practically inseparable. Apart from a few taken in copula there are about 130 females in the collection which belong to these two species. As indicated in the above list of localities this species occurs in saline as well as fresh lakes but is much less abundant than *E. boreale* as a general rule. I have seen it in vast numbers in northern Manitoba, however, where *boreale* was virtually absent (Walker '32).

10. *Enallagma hageni* (Walsh.). Near Indian Head, 26 VI (EMW); Wascana Lake, 2-12 VII (DJM); Bredin, 19 VII (DJM); Caron, 26 VI (EMW); between Herbert and Waldeck, 28 VI (EMW); Swift Current dist., 21 VI to 21 VII (FB); Maple Creek, 14-20 VI, 5 VII (PH); Edward Lake, 15 VII (JEM); Greenwater Lake, 14 VII (JEM); Jackfish Lake, 16 VII (JEM); Lashburn (P. Greer); Heart Lake, P. Albert Nat. Park 13 VII (GS). Total 82 ♂ 26 ♀.

Previously recorded from Regina (Walker, '12b). The dates range from June 14 to July 22 but the season of flight is certainly longer than this. It always emerges later than *E. boreale* where the two species occur together. The females listed are presumably *hageni* and not *ebrium* since they were associated with males of the former species. Pairs in copula were taken at Bredin, July 19 (2 pairs) and Maple Creek, June 20 and July 5 (2 pairs). The occurrence of this species about some of the saline lakes is of interest since in Ontario it appears to prefer acid waters. It is evidently abundant in the Transition zone in Saskatchewan as it is in the eastern provinces.

11. *Enallagma ebrium* (Hagen). Between Herbert and Waldeck, 28 VI (EMW); Lac Vert, 18 VII (JDR); Swift Current dist., 4-25 VII (FB); Turtle-

ford, 3 VII (DRF); Pasqua Lake, 25 VI (JEM); Jackfish Lake, 16 VII (JEM); Prince Albert, 8 VII (EWB); Waskesiu, 18 VII (ARB). Total 35 ♂ 1 ♀.

There are also in the collection female *Enallagmas* that may be either *hageni* or *ebrium* from Waskesiu, 23 VII (GS 1 ♀) and Hamton, 6 VI (JAG, 2 ♀). *E. ebrium* has been previously recorded from Carnduff (Walker '12b). The dates range from June 6 to July 25 but the season of flight is doubtless longer than this.

12. *Enallagma carunculatum* (Morse.). Echo Lake, 7 VII (JEM); Last Mountain Lake, 5 VII (JEM). Total 3 ♂ 3 ♀.

This is the first record of this species from the prairie provinces. Its occurrence at the above saline lakes is of some interest since it has been reported as breeding in brackish water (Osburn '06).

13. *Enallagma civile* (Hagen). Wascana Lake, 28 VII, 2 teneral ♂, 2 ♀ (DJM); Swift Current dist., 5-21 VI, 5-21 VII, 8 ♂ 1 ♀ (FB). Total 10 ♂ 3 ♀.

Mr. Bisal states that on July 21 there were "large numbers mating, rather abundant". This insect appears, however, to be local in Saskatchewan. As it is known to breed in brackish water (Osburn '06), it is somewhat surprising that it is not among the species taken by Mr. Moore in the saline lakes of the province.

14. *Agrion resolutum* Hagen. Burrows, 24 VI (EMW); Regina, 20 VI (coll. Univ. Sask.); Wascana Lake, 31 V, 9-10 VI (DJM); Yorkton, 6 14 VI (JAG); Hamton, 13 VI (JAG); Lac Vert, 14 VI (JDR); Prince Albert, 17-23 VI, 7 VII (DRF, EWB); Waskesiu Lake, 3 VI (Univ. Sask.); 18 VII (ARB); Mud Creek, Prince Albert Nat. Park, 24 VI (Univ. Sask.). Total 39 ♂ 27 ♀.

Previously recorded from "Saskatchewan" but without definite locality (Hagen in Selys, '76). The season of flight is early, the dates ranging from May 31 to July 1. It will undoubtedly be found throughout July, however, in the north at any rate.

15. *Agrion interrogatum* Hagen. The type locality of this species is "Saskatchewan" (Hagen in Selys, '76). While it has not since been recorded from the Province it is known from both Manitoba (Walker '33) and Alberta (Whitehouse '18a) as well as the eastern provinces and Newfoundland (Walker '15, '16b, '34). It should be looked for in muskegs north of Prince Albert.

16. *Agrion angulatum* (Walker). Carlyle, 17 VI (A. E. Cameron); Katepwa Lake, 17 VI (J. J. de Gryse); Burrows, 24 VI (EMW); Balgonie, 26 VI (EMW); Indian Head, 21 VI (DJM); Regina, 20 VI (Univ. Sask.); Waskana Lake, 26, 31 V, 9-10 VI (DJM); Caron, 21 VI (EMW); between Herbert and Waldeck, 28 VI (EMW); Hamton, 6-13 VI (JAG); Lashburn (P. Greer); Prince Albert, 21 V, 17-25 VI, 7 VII (DJM, EWB); Waskesiu Lake, 3 VI (Univ. Sask.). Total, 117 ♂ 42 ♀.

Previously recorded from Prince Albert (Walker '12b). A characteristic species of the boreal parts of the Central Plains.

The largest series comes from Prince Albert (47 ♂ 27 ♀) and it is doubtless more abundant there than in the more southern localities. It is probably the most abundant of the damselflies of northern Saskatchewan as it is at the Pas, Manitoba. The season is early, May 21 to July 1 being the period covered by the records. Specimens just emerged were taken on May 26 and June 9 (Wascana Lake).

17. *Nehalennia irene* Hagen. Burrows, 24 VI 2 ♀ (EMW); Zealandia 1 ♂ (Miss L. Garvie); Prince Albert, 24 VI (EMW).

Judging by records from the other provinces this species should be commoner than these few records suggest.

18. *Amphiagrion abbreviatum* Selys. Maple Creek, 5 VII '36, 1 ♀ (PH); Cypress Park, 11 VI, 1 ♂ (ARB).

The female specimen was identified by Mrs. H. K. Gloyd, who is preparing a monograph of the genus. This is the large western *Amphiagrion* which has been generally regarded as a race of the small eastern *A. saucium* (Burm).

Another specimen from Saskatchewan was in the collection but has unfortunately been mislaid.

This species as hitherto unknown in Canada east of Banff, Alta.

ANISOPTERA

Aeschnidae

19. *Aeschna eremita* Scudder. Prince Albert, 7, 8 VII (EWB); Waskesiu (Univ. Sask.); 9-23 VII (GS, ARB); Narrows Bay, Waskesiu Lake, 7 IX (Univ. Sask.); Stony Lake, 13 VIII (Johnson). Total 6 ♂ 2 ♀. Also listed by Mr. Shaw from Waskesiu, 1-7 VII, 4 ♂ 1 ♀ (determined by Montgomery).

The specimen taken on Sept. 7 is a newly emerged male. The normal season of emergence is late June and early July and, although full-grown nymphs may be taken later in the summer, they do not usually emerge until the following year.

A. eremita is undoubtedly abundant throughout the forested regions of Saskatchewan, as it is elsewhere in Canada at similar latitudes.

20. *Aeschna interrupta lineata* Walker. Regina, 26 VI (EMW); Swift Current dist., 5 IX (FB); Maple Creek (PH); Madison, 20-30 VII (JHY); Snipe River 22 VII (JHY); Hamton, 3-39 VI, 2 VIII, 6 IX (JAG); Humboldt 6 VIII (Univ. Sask.); Lac Vert, 19 VI, 16-21 VII (JDR); Vonda, 10 15 VII (M. MacKay); near Saskatoon? (AHS); Prince Albert, 7-29 VII, 2 VIII, 6 IX (DRF, EWB); Waskesiu Lake, 12-23 VII (GS, ARB); 3 VI (Univ. Sask.); Polwarth, VII (VLB); Mud Creek, Prince Albert Nat. Park, 24 VI (Univ. Sask.); Stony Lake (Johnson). Total 34 ♂ 46 ♀. Also listed by Mr. Shaw from Waskesiu, 23 VII, 1 ♂.

Previously recorded from Meota, Carlton, Duck Lake, Goose Lake, Parkside, Regina and Moose Jaw (Walker '12a, '12b). It is the common *Aeschna* of the prairies. The dates range from June 3 to Sept. 6 but the first date is an unusually early one. It is abundant in July and August.

21. *Aeschna canadensis* Walker. Prince Albert, 21 VI '13, 1 ♀ (EMW).

This species is not represented in recent collections but is probably not uncommon in the wooded parts of southern Saskatchewan.

22. *Aeschna sitchensis* Hagen. Lac Vert, 18 VII, 1 ♀ (JDR); Crean Lake, 12 VI, 1 ♂ (Univ. Sask.).

Previously recorded from Saskatchewan but without definite locality (Walker '12a). It should be common in the northern half of the Province.

23. *Aeschna umbrosa umbrosa* Walker. Lac Vert, 20 VII, 1 ♀ (JDR); Maple Creek, 2 ♂ 1 ♀ (PH); Waskesiu Lake, exuv. (JDR); Mud Creek, Prince Albert Nat. Park, 1 VI, nymph, penult. stage (Univ. Sask.). Also listed by Shaw from Waskesiu, 11 VIII, 1 ♂.

Probably common on small streams throughout most of Saskatchewan.

24. *Aeschna constricta* Say. Snipe Lake, 22 VII, 1 ♀ (JHY).

A transcontinental species but much commoner eastward.

25. *Anax junius* (Drury). Markinch, 1 ♂ (CW); Buffalo Lake, 30 V, 2 ♂ (Johnson).

This species is to be expected in southern Saskatchewan only, except as a wanderer.

Gomphidae

26. *Ophiogomphus severus* Hagen. Prince Albert, 11, 16 VII, 3 ♂ 2 ♀ (DRF); 26 VI, 1 ♀ (EMW).

This is the eastern limit of this species, so far as known.

27. *Ophiogomphus rupinsulensis* (Walsh). Recorded from Saskatoon (Walker '12b) and unknown in Canada farther west.

28. *Gomphus (Stylurus) intricatus* Hagen. Saskatoon, 1 ♂ (AHS); 2 VIII, 1 ♀, fragments of ♂ (coll. Univ. Sask.); Prince Albert, 11 VII, 1 teneral ♀ (DRF).

These records represent the eastern and northern limits of this species.

Corduliidae

29. *Cordulia shurtleffi* Scudder. Lac Vert (JDR); Crean Lake, 12 VI (Univ. Sask.); s. of Prince Albert, 9 VI (Univ. Sask.); Kingsmere Lake, Prince Albert Nat. Park, 31 V (JEM); Namekus Lake, Prince Albert Nat. Park, 30 V (DRF); Waskesiu Lake, 12 VI (Univ. Sask.); 28 V (DRF). Total 3 ♂ 7 ♀. Also listed by Shaw from Waskesiu, 10-24 VI, 3 ♂ 17 ♀.

Doubtless common throughout the forested regions of Saskatchewan.

30. *Somatochlora minor* Calvert. Recorded from Prince Albert (Walker, '25). It should be found along streams throughout the forested regions of Saskatchewan.

31. *Somatochlora ensigera* Martin. Maple Creek, 14 VI, 3 ♀; 2-3 VII, 3 ♀, 24 VII, 1 ♂ (PH).

The specimens taken on June 14 and July 24 are labelled "creek", while those taken in early July are marked "tumbling mustard on farm". The females are all somewhat teneral.

We were prepared for the discovery of this interesting species in Saskatchewan by the comparatively recent record of its occurrence in southern Manitoba (Walker '33).

32. *Somatochlora franklini* (Selys.). Seward, 10 VI (V. Willing, Univ. Sask.); Saskatoon, 14 VII (Univ. Sask.); Waskesiu, 7 IX (Univ. Sask.). Total 1 ♂ 3 ♀.

This northern transcontinental species is particularly abundant in Manitoba and should be also in Saskatchewan.

33. *Somatochlora whitehousei* Walker. Recorded from Prince Albert on the basis of an exuvia (Walker '25).

While this exuvia agrees with specimens of *S. whitehousei* from Banff, Alberta, we considered the record as doubtful as long as the nymph of *S. septentrionalis* was still unknown. Excuviae of the latter species, however, have recently been discovered by Mr. Whitehouse and have been examined by the writer. Although extremely like those of *whitehousei*, they are distinguishable and the record of this species from Prince Albert is thus confirmed. *S. septentrionalis* is to be expected from the northernmost parts of the province but not at the latitude of Prince Albert.

34. *Tetragoncunia spinigera* Selys. Mud Creek, Waskesiu Lake, 24 VI (Univ. Sask.); Heart Lake portage, 15 VI (Univ. Sask.). Total 1 ♂ 1 ♀. Also listed by Shaw from Waskesiu, 15, 19 VI, 51 ♂ 9 ♀.

Mr. J. E. Moore's collection of nymphs contains one full-grown specimen from Deep Lake, May 26. This is about the usual time of emergence in southern Ontario.

Libellulidae

35. *Libellula quadrimaculata* L. Regina, 5 VII (DJM); Hamton, 13 VI (JAG); Lac Vert, 14 VI (JDR); Lashburn (P. Greer); Prince Albert, 23 VI, 1-8 VII (DRF, EWB, EMW); "south of Prince Albert", 9 VI (Univ. Sask.); Namekus Lake 20 V (DRF); Waskesiu Lake, 23 V (DRF); 15 VII (ARB); Cypress Park, 8, 9 VI (ARB); Total 28 ♂ 16 ♀. Also listed by Shaw from Waskesiu, 15, 19 VI; 5 ♂ 3 ♀; 19 VII, 1 ♂.

Previously recorded from Duck Lake (Walker '12b); circumpolar and common in Canada across the continent.

36. *Libellula exusta julia* Uhler. Kingsmere Lake, Prince Albert Nat. Park, 31 V, 1 ♂ 1 ♀ (JEM). Also listed by Shaw from Waskesiu, 1-10 VII, 4 ♂ 1 ♀.

This species is transcontinental but there is a wide gap in its known range in Canada between Saskatchewan and western British Columbia.

37. *Sympetrum corruptum* (Hagen). Katepwa Lake, 24 VI (JEM); Little Fish Lake, 2 VII (JEM); Swift Current dist., 16-21 VI, 12 VII, 15 VIII (FB); Maple Creek, 24 VI (PH); Hamton, 13 VI, 17 IX (JAG); Prince Albert, 23 VI, 25 VII (DRF). Total 10 ♂ 10 ♀. Nymphs: Redberry Lake, 26 VIII; Kenderdines Lake, 20 VIII, 4 full-grown nymphs (JEM). Previously recorded from Regina (Walker, '12b).

Of the two specimens taken at Hamton, on June 13 and Sept. 17 respectively, the former was old and battered, the latter young. Similar records have appeared so often that they seem to indicate two peaks of emergence for this species. *S. corruptum* is more abundant in the prairie provinces than elsewhere in Canada.

38. *Sympetrum madidum* (Hagen). Indian Head, 26 VI (EMW); Piapot, 29 VI (EMW); Markinch (GW); Maple Creek, 24 VI (PH); between Alsask and Lovernia, 26 VI (DJM); Scott, 29 VI (DJM); Watrous, 2 VII (DJM); Liberty, 2 VIII (DJM); Humboldt, 1 VII (Univ. Sask.); Hamton (JAG); Vonda Lake, 10 VII (M. MacKay); Cudworth, 5 VII (M. MacKay); Elbow, 9 VII (W. Fox); Prince Albert, 23, 25 VI, 1-29 VII (DRF); Narrows Bay, Waskesiu Lake, 7 IX (Univ. Sask.); Basin Lake, 29 VI (JEM). Total 11 ♂ 16 ♀. Previously recorded from Battleford (Walker '12b).

A western species, ranging from the Pacific coast of southern British Columbia to Manitoba.

39. *Sympetrum obtusum* (Hagen). Lac Vert, 19 VII 1 ♂ (JDR); Big Manitou Lake, 16 VIII, 1 ♂ (JEM); Waskesiu, 17-21 VII, 11 ♂ 3 ♀ (GS). Total 13 ♂ 3 ♀.

This transcontinental species, the commonest of the dragonflies in the eastern provinces, appears to be local in the prairie provinces, perhaps owing to its preference for acid waters.

40. *Sympetrum decisum* (Hagen). Katepwa Lake, 25 VII (J. J. de Gryse, in Nat. Coll.); Indian Head, 11 VIII (Univ. Sask.); Balgonie, 26 VI (EMW); Regina and Regina Beach, 5-7 VII (DJM); Wascana Lake, 12-13 VII (DJM); Bredin, 19 VII (DJM); Markinch, 8-20 VII (GW); Waldeck Bridge, Swift Current dist., 30 VIII (FB); Maple Creek, 20-24 VI, 5 VII (PH); between Alsask and Lovernia 26 VI (DJM); Eston, 24 VII (JHY); Madison and Madison River, 22-30 VII (JHY); Snipe River, 15 VII (JHY); Kindersley, 25 VII (JHY); Glidden, 23, 27 VII (JHY); Hamton, 28 VII, 2 VIII, 10 IX (JAG); Watrous, 2 VII (DJM); Liberty, 2, 4, 30 VIII (DJM); Lac Vert, 18-20 VII (JDR); Vonda, 15 VII (M. MacKay); Saskatoon (A. H. S.); 16 VII (DRF); Elbow 9 VII (W. Fox); Duro, 16 VII (A. E. Cameron); Lashburn (P. Greer); Prince Albert, 23, 25 VI, 1-28 VII, 2 VIII (DRF); Polwarth, 12-13 VII (VLB); Waskesiu Lake (J. G. C.); 9-30 VII (GS, ARB); Big Manitou Lake, 16 VIII (JEM); Larder Lake, VIII (Johnson, Univ. Sask.). Total 168 ♂ 218 ♀.

Previously known from Indian Head, Regina, Lumsden, Davidson, Goose Lake, Saskatoon, Duck Lake, Kinistino, Birch Hills and Carlton (Walker '12b).

This is evidently the most abundant of all Anisoptera in Saskatchewan. The largest series come from Markinch, Prince Albert, Regina and the vicinity of Kindersley, but it appears to have been abundant wherever collections were made.

The dates cover a period from June 23 to Sept. 10, the great majority being in July. Copulating pairs were taken at Prince Albert on July 18 (3 pairs), at Bredin, July 19 (3 pairs) and at Lac Vert, July 19 (at least two pairs). Young individuals with the wings amber-coloured at base are extremely common. Most of these, but not all, are females.

41. *Sympetrum costiferum* (Hagen). Markinch, 20 VII (GW); Swift Current dist., 8, 15 VIII (FB); Hamton, 28 VII, 2 VIII, 10-18 IX (JAG); Saskatoon (A. H. S.); 8 IX (Univ. Sask.); Larder Lake, VIII (Johnson, Univ. Sask.); Prince Albert, 25-29 VII, 2 VIII, 6 IX (DRF); Big Manitou Lake, 16 VIII (JEM); Jackfish Lake, 11 VIII, 23 VII (GS); Midnight Lake, 31 VII (JEM). Total 39 ♂ 28 ♀.

Previously reported from Regina and Moosomin (Walker '12b). The dates range from July 20 to Sept. 13. The largest series is from Prince Albert (23 ♂ 12 ♀) and all the specimens, except one male, were taken from July 25 to Aug. 2. These are all more or less teneral, the majority newly emerged. The records suggest that this species may be the most tolerant of saline waters of all the *Sympetra*.

42. *Sympetrum danae* (Sulzer). Hamton, 10, 17 IX (JAG); Liberty, 2, 30 VIII (DJM); Lac Vert, 18 VII (JDR); Saskatoon, 27, 28 VIII (Univ. Sask.); Big Quill Lake, 2 IX (Univ. Sask.); Prince Albert, 26-28 VII, 2 VIII, 6 IX (DRF); Waskesiu Lake, 14 VII (GS); Midnight Lake, 31 VII (JEM). Total 22 ♂ 16 ♀.

A circumpolar species but hitherto unrecorded from Saskatchewan. It appears to frequent the saline lakes to some extent.

The dates range from July 14 to Sept. 10, the single specimen taken on July 14 being a newly emerged female. A pair in copula was taken at Big Quill Lake on Sept. 2.

43. *Leucorrhinia hudsonica* (Selys). Lac Vert, 17 VI (JDR); Wallwort, 15 VI (A. J. Breitung); Prince Albert, 26 VI (EMW); Waskesiu Lake, 3 VI (Univ. Sask.); 28 V (DRF); Mud Creek, Waskesiu Lake, 31 V (Univ. Sask.). Total 3 ♂ 6 ♀.

The dates, May 28 to June 26, do not nearly cover the seasonal range, which probably reaches the end of July. The scanty records of this common transcontinental species indicate that very little collecting has been done in Saskatchewan in the earlier part of the season.

44. *Leucorrhinia borealis* Hagen. Indian Head, 3 VI (J. J. de Gryse, Nat. coll.); Hamton, 13 VI (JAG); Lac Vert, 17, 19 VI (JDR); Prince Albert, 25, 26 VI (EMW); Waskesiu Lake, 3 VI (Univ. Sask.). Total 4 ♂ 4 ♀.

According to Whitehouse ('17) the season at Red Deer, Alberta, begins about the fourth week in May and it appears to be everywhere a very early species. As Saskatchewan is in the centre of its distributional range it should be common over more than the northern half of the province.

45. *Leucorrhinia glacialis* Hagen. Crean Lake, Prince Albert Nat. Park, 12-14 (Univ. Sask.); Kingsmere Lake, Prince Albert Nat. Park, 31 V (JEM). Total 2 ♂ 1 ♀.

The apparent rarity of this species, as indicated by the above records, is doubtless due to lack of collecting in the north and in early summer.

46. *Leucorrhinia proxima* Calvert. Crean Lake, Prince Albert Nat. Park, 12 V (Univ. Sask.); Waskesiu Lake, 14 VII (GS). Total 2 ♂.

Another species that must be abundant throughout the wooded parts of Saskatchewan, except in the extreme south.

47. *Leucorrhinia intacta* Hagen. Prince Albert, 25 VI (EMW); 21 VI (DRF). Total 4 ♂ 1 ♀.

This species should be common in the spring and early summer in southern Saskatchewan. Prince Albert is probably near its northern limit.

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EUPITHECIA NOTES*

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Through the courtesy and co-operation of the authorities of the United States National Museum, I have recently been enabled to examine material and to make genitalic slides of a few species of North American Eupithecias not hitherto available to me for study. As a result the correct relationships of certain species have been ascertained and in this connection the following notes are offered. Included are also descriptions of several apparently new species.

Eupithecia bindata Pears. A genitalic slide made from the female cotype in the U. S. N. M. proves to be the same as the slide I made some years ago from the female type of *plenoscripta* Hlst. in the same institution. A comparison of the two slides was made at my request by Mr. C. Heinrich who writes that "the genitalia of the female types of the two supposed species are alike as far as I can see, at least they show nothing that I should call specific differences". *Bindata* Pears. was based on a pair of specimens from Pullman, Wash. whilst *plenoscripta* was described from Yellowstone Park, Wyo., material. As these Yellowstone Park specimens are considerably larger and better marked than the Pullman ones, it might be well, pending receipt of more material from both localities, to consider *bindata* Pears. a race of *plenoscripta* Hlst.

Eupithecia longidens Hlst. The abdomen of the type male labelled "Colo. (Bruce)" in the Hult Collection at Rutgers College, New Brunswick,

*Contribution from the Division of Entomology (Systematic Entomology), Department of Agriculture, Ottawa.

N. J. is missing. I have, however, examined a male and three females from the U. S. N. M. Collection, including a type female which is undoubtedly conspecific with the Rutgers male. According to genitalia the species falls into the *palpata* group which comprises a number of closely allied species (probably all coniferous feeders as larvae) with long palpi and a simple *uncus* in the male genitalia. The position assigned *longidens* in the Check List is erroneous and it should be placed close to *palpata*; the type locality is probably Glenwood Springs, Colo.

I give a figure of the genitalia of the above mentioned Type female and also one of the genitalia of a female of *palpata* Pack. for comparison. The two are essentially of the same type with oval bursa and long neck, ending in a small blind membranous sack projecting slightly above the entrance of the *ductus bursae*. In *longidens* the *ductus seminalis* arises, however, more definitely on the dorsal side than in *palpata* and closer to the entrance of the *ductus bursae*; the spined areas on the bursa are weaker and less extended, leaving membranous sections on both right and left sides which are almost connected across fundus on dorsal side, the membranous connecting band only being interrupted by a few weak spines; on the ventral side the spined area does not extend as far toward base of neck as on dorsal side (fig. 1). In *palpata* (fig. 3) the bursa is evenly spined over its entire area, except just below exit of the *ductus seminalis*. The following third species in this group appears to be undescribed.

***Eupithecia alblimontanata* n. sp.**

Palpi very long and pointed, considerably longer than in *palpata*, smoky brown with slight admixture of white scaling; male antennae finely ciliate, female, simple; head and thorax clothed with a mixture of black and white scaling. Primaries blackish over a pale base, much the color of *edna* Hlst. as compared with the brownish color of *palpata*. The usual two dark, subparallel, oblique cross-lines are the most prominent features of the maculation, the inner one somewhat indistinct, the outer one angled rather sharply below costa and followed by a narrow, palish band through which runs a dotted line. The median area enclosed by these lines is slightly paler centrally and contains a small, dark, discal dot. The basal half of secondaries is bordered outwardly by a rather broad, curved, blackish postmedian line; this area is pale smoky, suffused with blackish above inner margin with indications of several cross-lines and contains a small black discal dot. Between the dark postmedian line and the broad smoky terminal space is a pale area as on primaries, containing traces of a similar dotted line. In the dark terminal band are indications of a pale, irregular subterminal line. Fringes on both wings light smoky, checkered with darker color. Beneath rather shiny smoky white with the postmedian lines on both wings very strongly developed. Expanse 20 mm.

Holotype—♀, White Mts., Ariz., June 26, 1935, (G. and J. Sperry); No. 4978 in the Canadian National Collection, Ottawa.

Allotype—♂, same data, June 27.

Paratype—1 ♂, same data, June 11, 1936.

In the male genitalia there is nothing very distinctive but the female genitalia (fig. 2) shows points of distinction from both *palpata* and *longidens*. The neck of the bursa is much broader at its junction with the sack proper than in *palpata*, the exit of the *ductus seminalis* is distinctly on the right side and not semidorsal, the bursa sack is more produced to the right, the spining finer, and there is a definite unspined area on right side above fundus.

The description of a species closely allied to the Rocky Mt. *maestosa* Hlst., and probably confused with same, may well be included here as *maestosa* is another member of the *palpata* group.

Eupithecia diegata n. sp.

Very similar to *maestosa* in both structure and maculation of wings. Size smaller. Primaries rather more suffused with brownish than *maestosa* in which the smoky shades prevail; maculation finer and less pronounced than in *maestosa*, none of the cross-lines being especially prominent; the t. p. line is the best defined, running parallel to outer margin with an inward bend at costa and preceded in central portion by slight dark dashes; the pale wavy s. t. line is faint and best indicated above anal angle. *The discal dot is scarcely visible and not distinct as in maestosa.* Expanse 15 mm.

Holotype—♀, San Diego, Calif. Aug. 29, 1921; No. 4979 in the Canadian National Collection, Ottawa.

Allotype—♂, same locality, Sept. 8, 1924.

Paratype—1 ♀, same locality, May 3, 1924.

In the male genitalia the row of minute spines above the curved piece of chitin in the aedeagus is not surrounded by fine spicules as in *maestosa*; the two chitinous rods of the ventral plate of the eighth segment are thinner and not so outwardly bowed, appearing in consequence closer together.

In the female genitalia (fig. 4) the main difference is in the exit of the *ductus seminalis* on the left side; in *maestosa* (fig. 5) it arises about halfway up the neck, and juts outward and downward; in the present species it runs upward, parallel to edge of neck to nearly its proximal end before curving downward; the neck furthermore is somewhat shorter and thicker.

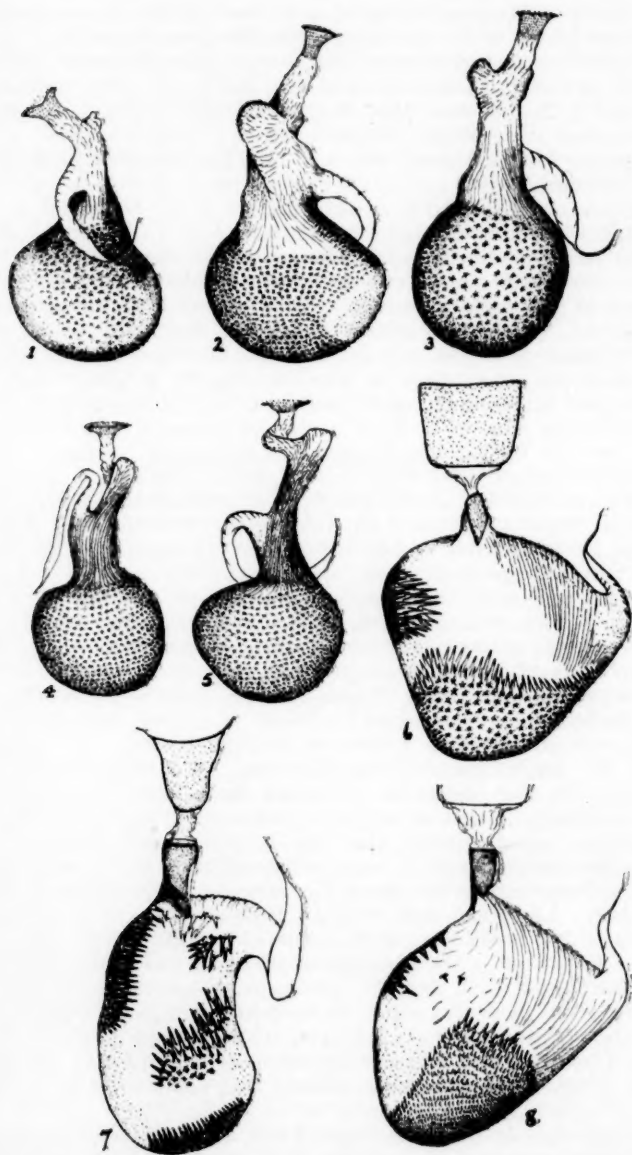
Eupithecia zygadaeniata Pack. The genitalic slide of a typical Texan female of this species looked so suspiciously close to my drawing of the genitalia of the female Type of *indistincta* Tayl. (now in the U. S. N. M. ex. Barnes Collection) that I asked Mr. C. Heinrich to make a comparison. He writes "I checked the slide of *zygadaeniata* (♀) with that of the ♀ type, of *indistincta*. They match in every detail of structure".

Indistincta, therefore, may be considered as a race of the Texan *zygadaeniata*, occurring in the southern Atlantic States, and characterized by its browner coloration and lack of definite maculation.

Eupithecia niveifascia Hlst. The species was described (Can. Ent., XXX, 115) from two specimens from Santa Fe, N. M. (Cockerell) and Oregon (Koebele), the former in the Hulst Collection and the latter in the collection of the U. S. N. M. Later Pearsall (1910, Can. Ent., XLII, 313), stating that the two specimens were not conspecific, restricted the name to the New Mexico specimen in the Hulst Collection and gave the new name, *segregata* to the female Oregon specimen, including under this name a male from S. Arizona (Poling) in his own collection as a co-type; the full description of *segregata* appeared practically simultaneously to his above mentioned note (1910, Proc. Ent. Soc. Wash., XII, 144). I have examined 1 ♂, 2 ♀ from Ft. Wingate, N. M., including one specimen which I had compared myself with Hulst's type when curator of the Barnes Collection. The genitalia of these specimens are identical with those of *perbrunneata* Tayl. and the specimens themselves agree very closely with our long series of *perbrunneata* from British Columbia. If desired the name *perbrunneata* Tayl. may be held as a doubtful race of *niveifascia* Hlst. from British Columbia and adjacent regions. The erroneous placement of *niveifascia* by Pearsall in *Nasusina* has already been commented on (1918, B. & McD. Contr. IV (2) 142).

As regards the identity of *segregata* Pears. I cannot at the present time make any definite statement but consider that, in view of Pearsall's remarks, the name should be definitely based on the Oregon specimen in the U. S. N. M. There is considerable likelihood that *segregata* may take priority over *bonita* C. & S., judging by several Oregon specimens of this species before me which match pretty closely a rather poor photograph of the type of *segregata* in our

PLATE III.



Female Genitalia of 1. *Eupithecia longidens* Hlst. Type, U. S. N. M. (dorsal); 2. *E. albimontanata* n. sp. Holotype (ventral); 3. *E. palpata* Pack. (ventral); 4. *E. diegata* n. sp. (ventral); 5. *E. maestosus* Hlst. (ventral); 6. *E. mutata* Pears. typical (ventral); 7. *E. spermaphaga* Dyar, type lot, (ventral); 8. *E. togata* v. *columbrata* var. nov., Paratype (ventral).

possession, and the males of which agree genitally with a paratype of *bonita* from Mill Valley, Calif. in the U. S. N. M. In any case both names should be removed from their present position and placed close to *niveifascia* Hlst.

Eupithecia balboata C. & S. The name *balboata* will fall as a synonym of *joanata* C. & S. Both species were described from San Diego, Calif. and the genitalia of paratypes of both in our collection are identical.

Eupithecia scabrogata Pears. The name was based on a female in the American Museum Collection labelled "Calif. (Hy. Edw.)" and definitely designated as holotype, and a male from Redington, Ariz. in the Barnes Collection. Unfortunately the abdomen of the female holotype has been broken off at some time or other; an abdomen in a small paper envelope, pinned below the specimen and purporting to be the correct abdomen, was submitted to me and a slide of the genitalia made. I now find that this agrees with the genitalia of a female specimen of *vistata* C. & S., received from the U. S. N. M., and believe, therefore, that the papered abdomen cannot be considered as that of the holotype female of *scabrogata*. A slide has also been made of the genitalia of the male paratype from Arizona and this has been found to agree with the figure given by Cassino (1925, *Lepidopterist*, IV, 48). A female from Mill Valley, Marin Co. Calif. from the U. S. N. M., which agrees well with the male Paratype of *scabrogata*, has genitalia similar to that of a female of form *gilvipennata* C. & S. in our collection from Oakland, Calif. which I have compared with the type in the Blackmore Collection, now in the University of British Columbia, Vancouver, B. C.

I think it may be accepted, lacking any further data, that Hy. Edwards' specimen came from the vicinity of San Francisco Bay and that, therefore, the Mill Valley specimen can be considered as being nearly topotypical and as representing the true *scabrogata*. This being the case *gilvipennata* should be reduced from the status of a species (as given in the Check List) to that of a mere form, as originally correctly designated.

Eupithecia graefii Hlst. The species was described as a *Eucymatoge* (1896, *Trans. Am. Ent. Soc.*, XXIII, 273) from specimens taken on Mt. Hood, Wash. in the collection of Mr. E. L. Graef. I have examined the genitalia of the type male, now in the collection of the U. S. N. M., and find no genitalic differences between this species and *vancouverata* Tayl. For the present Taylor's name can be used in a racial sense but when the specific variation is considered, as shown in our long series from Vancouver Is., even this appears to be rather superfluous.

Eupithecia pinata Cass. Attention should be called to a series of unfortunate errors made by Cassino in his description of this species. The description was included in a paper on "*Eupithecia* with Asymmetrical Genitalia" published in Vol. IV of the *Lepidopterist*, pp. 47-56, 1925. The name did not actually appear in this paper, but on page 52 we have the description of '*Eupithecia sierrae* race *joymaketa*', on page 53 a figure of the male genitalia of *Eupithecia gilata* and on page 54 the description of '*Eupithecia joymaketa*.' Later in the same volume, page 72, under "Correction" Cassino attempts to straighten out the matter of the double description of *joymaketa*; he states that the caption under the cut (on page 53) should read *Eupithecia pinata* and that the heading on page 54 should read *Eupithecia pinata*. Unfortunately he has perpetrated a further error in citing page 54 instead of page 52 for it is obvious that the real description of *pinata* appeared originally under the heading "*sierrae* race *joymaketa*". Not only does this description (and not that on page 54) fit paratypes of *pinata* in our collection but the statement on page 53 that the species was named for the county where it was captured would be meaningless if applied to *joymaketa* for there is no such county in Arizona as "Joymake" whereas Pinal Co. is at least represented in the name *pinata* by its first syllable. Furthermore the description on page 54 does fit paratypes before me, from Pinal Co., Ariz.,

labelled "*Eupithecia joymakeata*" (*sic*) and these show similar genitalia to those of *sierrae* Hlst.

Eupithecia spermaphaga Dyar. The species, described as a *Eucymatoge*, (1917, *Ins. Ins. Menstr.* V, 68) was later placed in the *togata* group of *Eupithecia* (1918, *B. & McD. Contr.* IV, 147). The holotype was designated by Dyar as a male specimen from Kaolin Beds, Oregon, reared from larva in the cones of *Abies concolor*. I have not had opportunity to examine the genitalia of this specimen and it is rather unfortunate that the male sex was chosen as holotype as in this group we find the best genitalic distinctions in the females. However, I was enabled to make a genitalic slide of a female (one of the type lot) from Sequoia National Forest, Calif., also reared from larva in cones of *Abies concolor*, a specimen which Mr. C. Heinrich assured me agreed in pattern with the holotype male. Judging by these genitalia *spermaphaga* shows sufficient distinctions from both the European *togata* Hbn., as figured by Petersen (1909, *Iris*, XXII, Pl. V, fig. 20) and somewhat differently by Pierce (1914, *Genit. Brit. Geom.*, Pl. XXXII), and our Eastern North American *mutata* Pears., to almost warrant its being raised to specific rank. A figure of the genitalia of this specimen (fig. 7) is given as well as one of *mutata* Pears. (fig. 6) which agrees absolutely with the genitalia of Pearsall's type female.

In British Columbia a third form exists which until recently I had been placing under the name *spermaphaga*. The female genitalia show, however, considerable differences in the armature of the bursa from both *mutata* and *spermaphaga* and are probably closer in this respect to the European *togata* than either of the others are. I offer the following description:

***Eupithecia togata* var. *columbrata* var. nov.**

Similar in maculation to the eastern *mutata* but rather brighter in color (especially in bred specimens); this is due to the paler ground color which on the primaries is very evident in the broad median band; the deep wine-red curved sub-basal and subterminal bands are very prominent as a rule and the white dentate s. t. line shows up well against the dark background. The black transverse lines are generally strongly marked as is also the large discal dot. On the secondaries the smoky terminal shading is variable in intensity, the pale dentate s. t. line varying in prominence according to the depth of the background. In the female genitalia (fig. 8) the thin membranous *bursa* is more or less obliquely rectangular, the *ductus seminalis* arising from the upper right-hand corner, the fundus is partially covered with a patch of strong, closely appressed spines, extending almost halfway up the right side and spreading out over both ventral and dorsal surfaces. On the left side, shortly below neck, is a row of strong spines, rather widely spaced and quite variable in number. Odd spines are found in variable numbers (1-5) on the unspined areas between the two main spine-bands. In the male genitalia there seems to be no very tangible difference from the allied forms.

Holotype—♀, Steelhead, B. C., May 19, 1934, (H. B. Leech). (From cones of *Abies amabilis* collected in summer 1933); No. 4977 in the Canadian National Collection, Ottawa.

Allotype—♂, Shawnigan, B. C., June 24, (E. H. Blackmore).

Paratypes—2 ♀, same data as holotype, June 1, 8; 1 ♀, same data as allotype; 4 ♀, Seton Lake, B. C., June 12, July 2, 15, 24, (J. McDunnough).

A NEW GENUS OF THE FAMILY DOLICHOPSYLLIDAE (SIPHONAPTERA) FROM CANADA

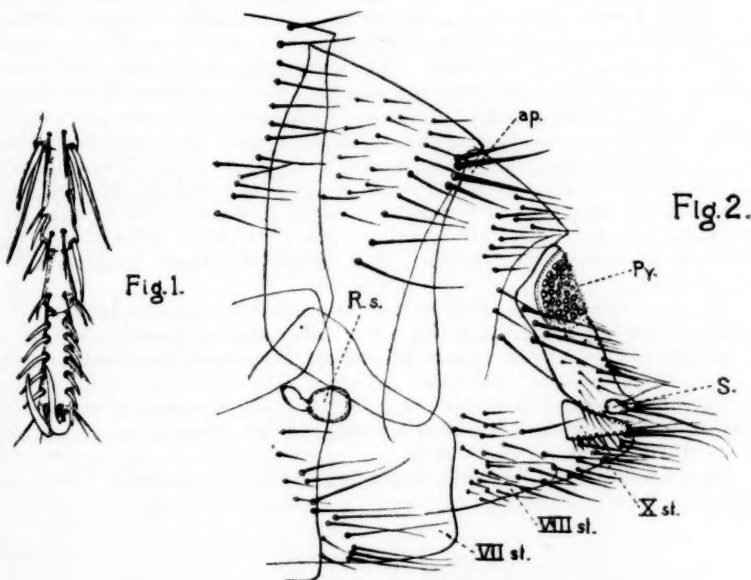
BY M. A. STEWART AND G. P. HOLLAND

University of California, Davis, Calif., and Dominion Entomological Laboratory, Kamloops, B. C.

Aetheopsylla gen. nov.

This new genus is apparently more closely related to the genus *Dolichopsylla* Baker 1906 than to any other known North American genus of Siphonaptera. But one specimen, a female, has been collected; however, it is so distinctive that the description of the genus is warranted.

The maxillae extend beyond the second segment of the rostrum. A frontal notch is present but it is located very far down on the frons. There is

*Aetheopsylla septentrionalis* sp. nov.

no genal ctenidium and the eye is conspicuous. The bristles of the second antennal segment are longer than the third segment. The labial palpus is 5-segmented and extends nearly to the distal end of the fore-femora. The occiput is without an oblique row of bristles. Dorsal spinelets occur on the first four abdominal tergites. Four antepygial bristles are present on each side in the female. Abdominal tergites 1 through VIII each bear 3 rows of bristles; the posterior of which extends below the stigmata. The inner sides of the metacoxae are without spinelets but are heavily bristled. The last segments of the fore- and mid-tarsi each possess 5 pairs of lateral plantar bristles and a pair of smaller bristles medianly placed distally. The last segments of the hind-tarsi have 5 lateral plantar bristles on one margin and 6 on the other plus the small median distal pair (Fig. 1).

Genotype: *A. septentrionalis* sp. nov.

***Aetheopsylla septentrionalis* sp. nov.**

Only the female of this new species is known. It is large, measuring in our mounted specimen 4.23 mm. in length, and is quite hirsute with long bristles.

The frons possesses three rows of bristles. The lower row is composed of 2 closely set bristles; the middle row of 4 bristles; and the upper row of 1 small bristle inserted above the anterior bristle of the middle row. Two relatively long bristles are located anteriorly to the base of each maxillary palpus. There are about 16 small bristles back of the antennal groove and posterior to these is 1 long occipital bristle.

The pronotum bears a ctenidium of 22 spines and immediately behind these a row of 15 bristles equalling or exceeding the ctenidial spines. The metepisternum has 3 bristles and the metepimeron an anterior row of 2 bristles, a middle row of 2, and a posterior row of 1.

The first abdominal tergite possesses 2 spinelets on either side, the second tergite 3, the third tergite 2 and the fourth tergite 1. The second abdominal sternite bears 2 small laterally placed bristles. The third to seventh abdominal sternites each have an anterior row of 2 bristles, a middle row of 4 to 6 bristles, and a posterior row of 7 to 9 bristles. The upper and lower antepygial bristles are shorter than the 2 middle ones and a small lobe extends caudad between the 2 groups of antepygial bristles. There are 5 heavy bristles below the pygidium. The body of the receptaculum seminis (Fig. 2) is dark and subglobular and is slightly longer than the tail. The posterior margin of the seventh sternite is not incised. The style is about twice as long as broad at the base and is sharply pointed. It possesses 1 terminal bristle, 2 dorso-lateral bristles, and 1 ventro-lateral bristle. The tenth sternite is heavily bristled, triangular in shape and straight on the ventral margin. The eighth and ninth sternites are also heavily bristled.

The posterior margins of the tibiae are armed with heavy spine-like bristles arranged for the most part in pairs. The metatarsi are heavily clothed with stout bristles. The longest apical bristle of the second hind-tarsal segment exceeds the third segment in length.

The single female specimen was collected from *Marmota monax petrensis* Howell at Wigwam Mine, British Columbia, about 22 miles south of Revelstoke, on May 21, 1939, by E. R. Buckell.

The type is deposited in the Canadian National Collection at Ottawa.

RESEARCH NOTES**NOTES ON ANDRENA CAMPANULAE. VIERECK AND COCKERELL**

This bee was described in 1914 (Proc. U. S. Nat. Mus., XLVIII, 35 and 43) from specimens taken in Colorado and Nebraska. I have it also from Mandan, North Dakota, July 15, 1915, collected by O. A. Stevens at flowers of *Campanula rotundifolia*. The species is probably obligotropic on *Campanula*. It is to be added to the Canadian list, three females having been taken at Beaverlodge, Alberta, July 19, 1931, by E. H. Strickland; and one at Bilby, Alberta, July 12, 1924, by O. Bryant. Three females taken by O. Peck at Beaverlodge, July 31 and August 10, agree in general with *A. campanulae* but have the first recurrent nervure joining second cubital cell not far from the end. This insect, apparently flying later than typical *A. campanulae*, may be called variety a. It possibly visits different flowers and is worthy of a separate name, but I cannot affirm this at present.

T. D. A. Cockerell.

ADDITIONAL NOTES ON STRYMON ACADICA EDW. (LEPID., LYCAENIDAE)

In a recent publication by Abel Dufrane entitled "Lycaenidae", (Bull. et Ann. Soc. Ent. Belgique, Vol. 79, Fasc. VIII, 289, 1939), a subspecies of *Strymon acadica* Edw. is described under the name *watrini* from a single male specimen, with the type locally given as "Saskatchewan, Canada". This author has apparently overlooked, or does not recognize as being valid, the name *muskoka* Comst. & Wats. which they applied to an aberrant form from Gravenhurst, Ont., and which I discussed in the CANADIAN ENTOMOLOGIST, LXX, 246, 1938. In that paper I suggested that proposing a new name for the darker subspecies occurring in the Canadian faunal zone might incur synonymy if the quadrinomial name *muskoka* be recognized as having any validity, there being no provision for such in the International Rules.

Following the method used in the new Check List, I am inclined to list the species as follows, if the name *watrini* is accepted:

acadica Edw.

souhegan Whit.

ab. swetti Wats. and Comst.

a watrini Dufr.

ab. muskoka Wats. and Comst.

b coolinensis Wats. and Comst.

c montanensis Wats. and Comst.

T. N. Freeman, Division of Entomology (Systematic Entomology), Department of Agriculture, Ottawa.

REPORT OF THE MONTREAL BRANCH, ENTOMOLOGICAL SOCIETY OF ONTARIO

The sixty-sixth annual meeting of the Montreal Branch of the Entomological Society of Ontario was held on Saturday, May 13, 1939, in the Lyman Entomological Room, McGill University, Montreal.

Eight meetings were held during the season 1938-39, seven in the Lyman Room and one in the Entomological Laboratory of the University of Montreal. The average attendance was nine.

The following papers or talks were delivered during the season: Presidential Address—Entomology in Montreal in the Past, the Present and the Future—Mr. H. A. U. Monro.

Notes, Season of 1938—Mr. G. A. Moore.

The Summer Meeting of the American Association for the Advancement of Science—Mr. H. A. U. Monro.

Wasps' nests, illustrated by moving pictures—Dr. A. Willey.

The 75th Anniversary Meeting of the Parent Society—Mr. H. A. U. Monro.

The Family Membracidae—Mr. G. A. Moore.

Exhibition Work of the Division of Entomology—Mr. C. B. Hutchings.

Lepidoptera from Trinidad—Mr. E. Munroe.

Entomological Conditions in Nigeria—Dr. G. Fisk.

The Family Cimicidae—Mr. G. A. Moore.

The Life History of a Neuropteran—Mr. G. Chagnon.

Mimicry among Insects—Mr. E. Munroe.

Parthenogenesis and Cytology of the European spruce sawfly, *Diprion polytomum* Htg.—Dr. S. G. Smith.

The following were elected officers for the coming year: President, G. A. Moore; Vice-President, Rev. Father O. Fournier; Secretary-Treasurer, H. A. U. Monro; Council, Mrs. E. G. Grieve, Mr. G. Chagnon, Mr. A. C. Sheppard, and Mr. J. W. Buckle.

BOOK NOTICES

DESTRUCTIVE AND USEFUL INSECTS, THEIR HABITS AND CONTROL
By C. L. Metcalf and W. P. Flint. McGraw-Hill Book Co. Inc., New York.
Pages i-xvi and 1-981; 584 illustrations. Second edition, 1939. Price \$7.50.

For the past decade the first edition of 'Metcalf and Flint' has been well known to American entomologists as one of the most useful texts on applied entomology. Of recent years, as with all scientific works, it has become somewhat out of date, particularly with reference to insecticidal control. This second edition, which, as the authors state, is a complete revision, has once again made 'Destructive and Useful Insects' the most useful book of its kind to the entomologists of Canada and the United States.

Except for minor word changes, the chapter headings remain as in the first edition. The subject matter, particularly with reference to destructive insects, has been rearranged and follows a definite sequence. A convenient system of cross reference has been added. Although the present edition contains only 63 pages more than the first, 23 new illustrations, valuable keys for the identification of adult and immature stages, and a number of synoptic tables have been added and the index increased by 23 pages. According to the authors' estimate, about twenty per cent more material has been incorporated in this edition. This increase in material without greater increase in the number of pages has been made possible only by closer spacing of the type and a competent treatment of the material.

On random comparison of the two editions, one cannot help but feel that the authors have an intimate knowledge of their subject and have kept well abreast of the times.

R. H. Ozburn

A LABORATORY GUIDE IN ENTOMOLOGY FOR INTRODUCTORY COURSES.
By Robert Matheson. Comstock Publishing Co., Inc., Ithaca, N. Y. Pages 1-vii and 1-135. 49 plates, 5 text figures. 1939. Price \$2.00.

This laboratory guide, which has a staple binding and has perforated pages to permit of use in a standard 8½" x 11" loose-leaf note book, is based on 28 study periods. Of these the first deals with the crayfish as a crustacean type and the remainder with insects. The studies on insects are organized as follows: the external and internal anatomy using the grasshopper as a type; mouthparts; metamorphosis and growth; identification to orders and families; some insect adaptations (morphological, food procuring and protective); sound producing organs; social life; insect pollinators; insects in relation to disease; and the insect control problem. Almost half of these studies deal with the identification of insects, with keys to the main orders and families accompanied by sufficient text matter on structure and wing venation to render the keys usable to the beginner.

The studies are followed by a short appendix covering the main essentials in collecting, preparation, preservation, and rearing of insects and a short glossary of the more common entomological terms.

An introductory course in Entomology based on this manual should give a student a broad conception of the field. The value of this as a foundation for further work would depend upon the manner in which the course was taught. As the author suggests, line drawings for the student to label would undoubtedly allow more time for the study of the insects themselves, but whether increased time for study and labelling the prepared drawings would impress the fundamentals to the same extent as making the drawings is another question.

R. H. Ozburn

Mailed Monday, March 11th, 1940.

Guelph Printing Service

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